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VOLUME 3: RANGE USERS INFORMATION (NASA)
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Wallops Station Handbook

VOLUME III

RANGE USERS INFORMATION

WALLOPS ISLAND, VIRGINIA

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WALLOPS STATION HANDBOOK

VOLUME III

RANGE USERS INFORMATION



31 August 1961

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SECTION I

INTRODUCTION

PURPOSE

The purpose of this volume is to provide the prospective range user with certain procedures necessary for the fulfillment of a given project using Wallops Station facilities. Included are procedures for obtaining authorization for range use as well as those required for efficient project coordination between the range user and range personnel. In addition, this volume describes in detail the information required from the range user which will enable the Wallops Station Project Engineer to determine the potential project workload and range safety requirements for effective range planning and scheduling.

RANGE SAFETY POLICIES

Range users must not ship rocket motors, explosives, liquid rocket propellants or other hazardous liquids, or any other dangerous device to Wallops Station without the permission of the Range Safety Section unless this motor, explosive, liquid, or other dangerous device is on the Wallops Station Approved List of Hazardous Materials. This list is revised from time to time to include new materials, and the latest issue of the list should be obtained before contemplating shipment of such materials to Wallops Station. In general, those solid-propellant rocket motors listed in the various tables in Section II, Volume IV, Safety, of the Wallops Station Handbook are included in this list. In addition, such explosives as igniters of various kinds, commercial squibs, Composition C, HBX-1, detonating cord, pentolite, and pyrotechnics (ICC special fireworks classification) are included. Thermite and metallic sodium are also included. Fuming nitric acid, analine, furfuryl alcohol, concentrated hydrogen peroxide, sulfur trioxide-chlorosulfonic acid mixture (FS), and liquid hydrogen are included among the hazardous liquids on the approved list.

When applying to the Wallops Station Range Safety Section for approval to ship a hazardous material not on the list, include such information as the Department of the Army Ordnance Corps or Air Force quantity-distance classification of the material, the Ordnance Corps compatibility group classification of the material, and any special precautions which must be employed in transporting, storing, handling, and using the material. In addition, give the ICC explosive classification, if an explosive, and the ICC label type and color.

Refer to Volume IV for Wallops Range Safety Policies and Procedures.

SECTION II

AUTHORIZATION AND LIAISON PROCEDURES

AUTHORIZATION FOR RANGE USE

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

All NASA agencies participating in approved programs are authorized to use the Wallops Station range facilities. Further authorization is normally not necessary since this authorization is included as a part of the approved program if the required tests fall within the capabilities of Wallops Station. However, it is advisable for the prospective NASA range user to inform the Flight Test Division, through the office of the Director, Wallops Station, of the potential workload as early as possible in the program. This will alert Wallops Station as to the general requirements of the potential user's program, and will enable the Flight Test Division to adequately develop range facilities and techniques for that program. In addition, safety requirements for the vehicle can be established at an early date.

OTHER PROSPECTIVE USERS

Other prospective range users, such as other government agencies, government contractors, or research firms, may request authorization to use the Wallops Station facilities. Such authorization must be requested and obtained from the Office of Space Flight Programs, National Aeronautics and Space Administration, Washington, D.C. However, prospective range users are advised to first discuss their requirements with the Director, Wallops Station, or his appointed representative before requesting formal authorization. The prospective range user can then determine beforehand the feasibility of using the Wallops range for his program, the dates which are open for the test, and the amount of long-range planning and scheduling necessary. Wallops Station will then be aware of the prospective user's program and will be ready to begin long-range planning when and if authorization for the program is granted.

UNITED STATES AIR FORCE PROJECTS

A special liaison office is available for USAF range users for initial contact with Wallops Station. The prospective USAF range user should first contact the ARDC/NASA Liaison Office at Langley AFB, Virginia and discuss his program with the officer in charge. Following this discussion, the liaison office will contact the proper Wallops Station personnel and arrange a satisfactory program schedule.

SCHEDULING

The Langley Research Center and the Goddard Space Flight Center are the principal Wallops range users. Each of these centers furnishes Wallops Station a proposed schedule which includes all known future firings. These schedules are revised monthly. It is important that individuals from these centers see that their particular test appears on their center's schedule as early as possible, since this schedule serves as the center's official notification, to Wallops Station, of their intention to perform a test.

Wallops Station combines the Langley and Goddard schedules, along with all known approved proposals from other NASA or outside agencies, into a Wallops Station Schedule. This schedule is revised on the first of each month and is submitted to the Director, Space Flight Programs. When approved, it becomes Wallops' authority for conducting the tests which appear on the schedule.

In order to resolve the many conflicts in time, launcher availability, shop space, etc., and to make the schedule as realistic as possible, Wallops Station holds a scheduling meeting at the end of each month in which the schedule for the next sixty days is reviewed in detail. Generally, the Goddard Space Flight Center and the Langley Research Center are represented at these meetings. Other range users are invited to attend these scheduling meetings in order that any problems can be discussed and resolved if possible. All range users will be notified as to time and place of these meetings if the user so requests. All requests for notification should be addressed to the Wallops Station Technical Liaison Section.

RANGE CLEARANCE AGREEMENTS

Wallops Station has written agreements concerning range clearance coordination with the Commander in Chief, U.S. Atlantic Fleet, FAA New York Air Route Traffic Control Center, San Juan OAC Center, and the Bermuda Approach Control Area Center.

The Navy agreement outlines procedures to be used in scheduling rocket launches into the Virginia Capes Operating Areas. Rocket launches are scheduled ten to thirty days in advance depending upon launch azimuth and sub-areas involved. Under this agreement the five-mile free lane at latitude 37° is to be kept free of impacts. This agreement also outlines coordination procedures to be used for oceanic impact areas outside the Virginia Capes Operating Areas.

The New York, San Juan, and Bermuda agreements establish criteria and procedures to be used during periods in which rocket launching operations are scheduled to be conducted from Wallops Station to various points within or through the New York Oceanic Control Area, the San Juan Oceanic Control Area and Flight Information Region, and the Bermuda Approach Control Area. Operations are scheduled ten days in advance. Rocket launches are made on a non-interference basis with non-participating aircraft. Launchings are not permitted when there will be non-participating aircraft in any impact area at time of impact. An impact area is described as a two sigma dispersion area surrounded by a 60 nautical mile buffer. The agreement states that after descending to 50,000 feet in altitude, the rocket is in the impact area. The Bermuda agreement also places certain restrictions on impact area and over-flight.

In all agreements it is understood that Wallops Station is the coordinating agency for all launching operations originating at Wallops Island.

OPERATIONAL CHANNEL OF COMMUNICATIONS

During the lifetime of a typical program, from the initial planning to actual countdown, Wallops Station maintains a clear-cut channel of communications between the range user and the Wallops Project Engineer. Figures 1, 2, and 3 illustrate how this channel of communications is maintained with respect to the range user through the three phases of any program.

PRELIMINARY WORK

All preliminary discussions of the user's program are carried on between the Wallops Project Engineer and the range user. The Wallops Project Engineer will coordinate all advanced planning as necessary with the Wallops Station Flight Test Division and other range activities.

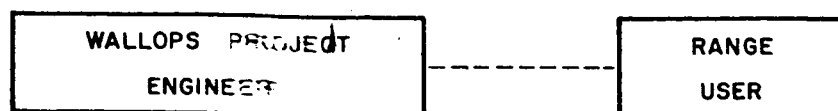


Figure 3-1. Channel of Communications During Preliminary Work

PRE-LAUNCH ACTIVITIES

All prelaunch activities which directly relate to the range user's program are under direct control of the Wallops project engineer. During this phase of the program, the range user maintains his contact with the Project Engineer who, in turn, coordinates the user's requirements with the Wallops Range.

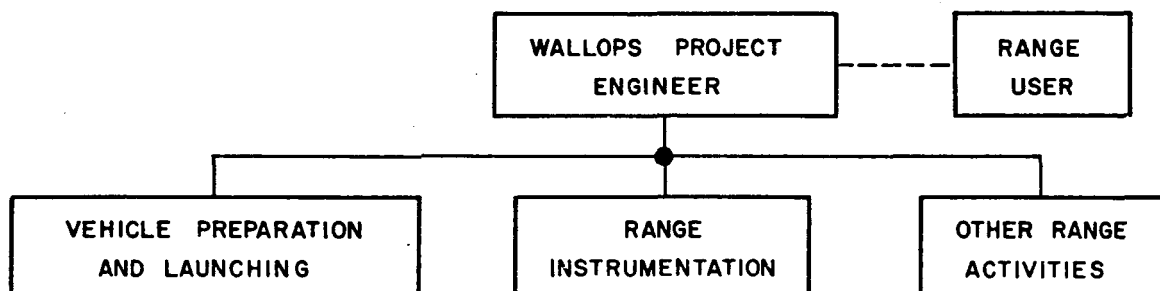


Figure 3-2. Channel of Communications During Pre-Launch Activities

COUNTDOWN OPERATIONS

During the final phase of the test program, the range user still maintains direct communications with the Wallops Project Engineer. However, complete control of the actual countdown and launching is now placed under the Wallops Test Director with all major range activities reporting directly to him. The Wallops Test Director has the final authority to proceed with the test or to hold as necessary during the entire countdown as well as the authority to postpone or cancel the countdown should conditions warrant this decision.

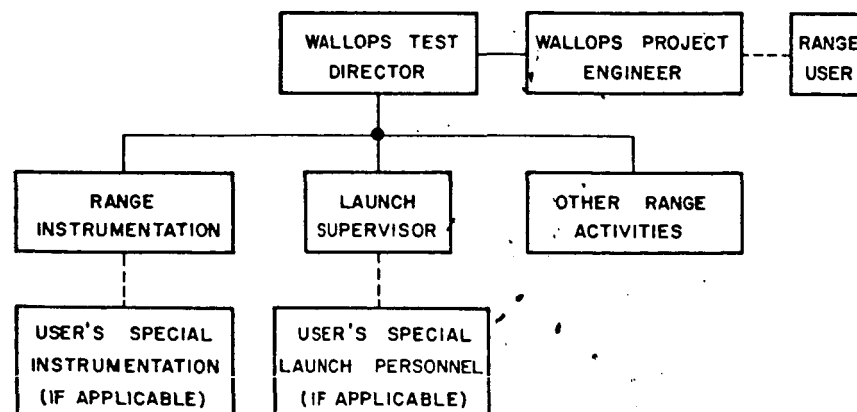


Figure 3-3. Channel of Communications During Countdown Operations

SECTION III

TECHNICAL INFORMATION REQUIREMENTS

PRELIMINARY DISCUSSIONS

As mentioned in Section II, the prospective Wallops range user should always begin his program planning by discussing the general scope of his program with the Technical Liaison Section, Wallops Station. Once the tentative range requirements have been established and authorization obtained, where appropriate, from Headquarters, NASA, the Technical Liaison Section of the Wallops Flight Test Division will assign a Project Engineer to coordinate the user's program with the Wallops range.

The lead time required for these preliminary discussions is variable and depends much upon the complexity of the intended program. However, it is highly desirable that the range user have his preliminary data ready for discussion with Wallops Station at least four to six months in advance of the desired test date. The Project Engineer is then allowed ample time to schedule range time and coordinate alternate test dates with the necessary outside agencies.

GENERAL PROGRAM DESCRIPTION

Following the preliminary discussions with the Wallops Project Engineer, the range user should submit a written description of the approved test program. This program description should be submitted to the Director, Wallops Station and should contain the following information:

TEST DESCRIPTION

The test description should include the purpose of the test, the cognizant organization, the name of the project manager representing the range user, suggested areas of responsibility, the proposed test date, and the security classification of the project.

TEST VEHICLE DESCRIPTION

The vehicle description must include the type of vehicle, the number of stages, the type of propulsion system, and other general operational features. It should also be noted whether or not the particular type of vehicle has been used for similar tests in the past, and if any special handling or launching techniques will be necessary.

PAYLOAD

Describe the payload, if applicable, as well as details of the experiments included and the methods used to accomplish the purpose of the test.

SAFETY INFORMATION

Give rough dispersion data in terms of 1, 2, and 3 sigma curves for all impacts and any other safety data which may be used for analysis of safety requirements.

It is desirable that this preliminary description be completed and in the hands of the Wallops Project Engineer no later than four months prior to the scheduled test date.

LONG-RANGE PLANNING AND SCHEDULING DATA

Once the general program description has been submitted to the Wallops Project Engineer, the range user should, no later than three months prior to the scheduled test date, prepare and submit his long-range planning data. This data must be approved in all respects by the user's chain of command before presentation to Wallops Station, since the data will be used by the Wallops Project Engineer to prepare an official test directive which will be used by all personnel to be engaged in the program. The following data must be provided at this time:

NOTE

The Wallops Station Range Safety Section may require additional information. The range user will be informed by the Wallops Project Engineer if any such information is necessary.

PROGRAM DESCRIPTION

If the general program description submitted previously has undergone major change, a new program description must be provided at this time.

DRAWINGS

Three copies of the following drawings are required:

VOLUME III

Section III

Vehicle Outline Drawings

These drawings should give all details necessary for proper assembly of the test vehicle or model. Include all pertinent dimensions and a complete parts list.

Pyrotechnics

Schematic and wiring diagrams of all pyrotechnic circuits and all other circuits physically or electrically related to pyrotechnics. For each squib, show the minimum firing current, recommended firing current, and nominal resistance on the drawings. Scale drawings must be supplied for any vehicle having r-f transmitters or beacons, showing the location of all pyrotechnic devices in relation to all transmitting antennas. The frequency range, type of emission, and radiated power (both peak and average) shall be shown for each transmitter or beacon.

Umbilicals

Complete drawings of all umbilical connections must be provided and must also meet with approval by the Range Safety Section.

WEIGHTS

The following list of weights and weight data is required:

Launch Weight

This is the total vehicle and payload weight prior to launching.

Weight-Versus-Time Curve

This curve is a plot of estimated vehicle weight versus time in trajectory from the moment of launching to splash time.

Payload Weight

Give the weight of both payload structure and instrumentation.

Loaded Rocket Motor Weights

Give the loaded weight of each stage if the vehicle is a multi-stage booster.

Empty Motor Case Weights

Give the empty weight of each motor case of a multi-stage vehicle.

Stage Adaptor Weights

In a multi-stage vehicle, give the stage adaptor weights for each vehicle stage and the weight of the payload adaptor if applicable.

Fins and Mounting Hardware Weights

Give the total weight of all fins and mounting hardware for each stage of a multi-stage vehicle.

Weights of Any Additional Parts

The weights of all additional parts such as heat shields, fairings, nozzle extensions, etc., should be given. When the test vehicle is a multi-stage type, these additional weights should be listed by stage.

PROPELLANT SYSTEMS

The data required relating to the test vehicle propellant systems include the following:

Type of Propellants

Give the type of propellant used in each stage of the vehicle, solid or liquid.

Thrust-Time Curve

Plot the thrust in pounds produced by each stage versus burning time.

Effective Burning Times

Give the burning time in seconds for each stage of the vehicle.

Total Impulse

Give the total impulse of each stage expressed in pound-seconds.

VOLUME III

Section III

Specific Impulse

Give the specific impulse for each stage expressed in pounds of thrust at the expenditure of one pound of propellant per second.

Special Handling and Environmental Requirements

Describe all special handling requirements for the vehicle and give the rocket motor storage temperature limits if applicable.

PERFORMANCE DATA

The following performance data should be presented for variance of elevation angles (include source of data, or how derived).

Trajectory for Normal Conditions

1. A plot of altitude versus range to impact for each stage and show important time points along the curve. Describe the range used; i.e., horizontal, curved earth, rotating earth, etc.
2. A plot of altitude versus time and indicate whether the earth's curvature correction has been applied to the altitude axis.
3. A plot of velocity versus time for each stage of the vehicle.
4. A plot of acceleration versus time for each stage of the vehicle.
5. The ignition and burnout times of each stage expressed in seconds from zero launch time.
6. A plot of drag curves versus Mach number for each stage during burning and non-burning.
7. The method of trajectory calculation.
8. A wind effect analysis and the methods used for calculation.
9. Stability data for all stage combinations.
10. A preliminary dispersion analysis showing proposed impact areas in terms of 1, 2, and 3 sigma curves.

11. Any other available aerodynamic data.

Trajectory for All Possible Abnormal Conditions

Plot the calculated trajectories for all possible abnormal conditions. For example, if the vehicle consists of one SERGEANT and two RECRUITS for the first stage, give the trajectory which would result if one RECRUIT fails to fire, etc.

LAUNCHER INFORMATION

The following launcher information is required:

Type of Launcher

State the type of launcher required for the vehicle; i. e., mobile, fixed, rail, zero length, etc.

By Whom Furnished

State whether or not it is planned to use the launching facilities available at Wallops Island. If not, give details explaining who will furnish the launcher.

Special Launcher Requirements

State whether special pad preparation and work platforms will be necessary, or whether any other special requirements pertain.

LAUNCH CONDITIONS

The following launch conditions should be stated:

Time of Day

If required, give the preferred firing time and the allowable time spread in case of holds. To ensure that preparations for a given test occur during normal working hours, the preferred firing times for Wallops Station are between 1300 and 1630 hours. If the desired firing time is not during these hours, give also the reason for this time and state whether or not the desired time is absolutely necessary.

VOLUME III

Section III

Elevation Angle

Give the desired elevation angle for the test and the amount this angle may be adjusted for purposes of range safety or other reasons.

Firing Azimuth

Give the desired firing azimuth if specifically required and the amount this azimuth may be adjusted for purposes of range safety or other reasons.

CANCELLATION CONDITIONS

State the conditions under which the test should be postponed in terms of the following:

Maximum Wind

Give the maximum wind loadings allowable for the test. If possible, state the effects of high altitude versus surface winds and which should be used to determine cancellation conditions.

Clouds and Visibility

State the maximum cloud cover allowable and the amount of visibility necessary for a successful test.

Other Considerations

List any other conditions which would adversely affect the purpose of the test such as precipitation, humidity, temperature, etc.

WALLOPS SUPPORT REQUIRED

List, under each of the following areas, the amount of support the Range User will require from Wallops Station:

Engineering

State whether or not special technical advice will be necessary, and if so, in what areas. In addition, state if the services of the standards laboratory or the instrument calibration and service shop will be needed. State any other engineering service that may be required.

Instrumentation

State the requirements for instrumentation necessary for the performance of the test. The following items should be included, if applicable:

1. Type of tracking, skin or beacon.
2. Telemetry data such as type, performance, frequencies, channels, data points required, etc.

NOTE

When supplying information under 1 and 2 above, include information on coverage, such as the time or distance over which the data are required, and the geographical location. Also supply information on the sampling rate.

3. Command function requirements.
4. Space requirements for any other special instrumentation. Give types of equipment and power requirements.
5. Describe timing required by project.
6. Describe communications requirements and the purpose of such communications. Include radio, telephone, and intercomm.
7. State whether or not closed-circuit television is required by the project.
8. Describe the desired photographic coverage in terms of documentary, model performance, pre-flight checkout, record or sequence at lift-off. Describe any other coverage desired, and state what will be supplied by the user and by Wallops Station.
9. Define the type of meteorological support required by the test and any special services that may be required.
10. Any other instrumentation requirements which are applicable to the test.

NOTE

If applicable, describe the electromagnetic radiation characteristics of special equipment including the purpose or function of the equipment, type of emission, average and peak power output, modulation characteristics, antenna description, and expected location of equipment with respect to the test vehicle launch site.

Vehicle Preparation and Launching

Define the work space which will be necessary for the preparation of the test vehicle, the number of vehicles to be furnished, and the number and type of other major pieces of equipment. State if the vehicles must be tested for center of gravity, moment of inertia, and if dynamic/spin balancing will be necessary. Describe any other preparation and launching requirements which are applicable to the test.

Data Reduction

Describe the type performance data required by the test and whether telemetry processing will be required. Describe any other support necessary as applicable.

Special Support

Under this category, list the support required from services other than those of the Wallops Flight Test Division such as Technical Services and Administration. Included in this area are machine shop services, electrical wiring, painting, etc. Included also would be recovery operations, if applicable, and support from outside agencies for downrange instrumentation, etc. List every possible support service which may be necessary. Indicate equipment, office space, furniture, etc., to be furnished by Wallops Station.

Range User Personnel

Estimate the number of personnel which will be assigned by the user to Wallops Station for the project. Indicate job classification, arrival date and departure date and whether or not space will be required in the Wallops Dormitory. Also indicate the number which can be expected to have their meals at the Wallops Cafeteria.

HARDWARE

Give the estimated arrival dates of all hardware at Wallops Station and furnish all special instructions if required. It is essential that a complete parts list be furnished prior to shipment of any hardware. The range user should also inform Wallops Station of any changes in the parts list as soon as they are made.

PROJECT CLASSIFICATION

Indicate the security requirements, if any, of the project and whether or not classified material is to be handled or stored at Wallops Station.

INFORMATION CHANGES

Any changes in the long-range planning and scheduling data furnished above must be given to Wallops Station as they occur. Otherwise, serious delays may result in the user's program. All such changes should be called to the attention of the Wallops Project Engineer.

TEST PREPARATION DATA

The range user should submit the following data to the Wallops Project Engineer no later than one month prior to the scheduled test date. The exact timing of this data is dependent upon the complexity of the project, and the Wallops Project Engineer will determine in each case if a lead time of more than 30 days is necessary. The information to be furnished at this time is as follows:

CHANGES

Give any changes which are required to bring the Wallops Project Engineer up to date.

FINAL DRAWINGS

Six copies of each of the following drawings should be supplied to the Wallops Project Engineer:

VOLUME III

Section III

Vehicle Outline Drawings

These drawings should give the final details necessary for proper assembly of the test vehicle. All dimensions and a final parts list should be included.

Pyrotechnics

Final schematic and wiring diagrams of all pyrotechnic circuits and all other circuits physically or electrically related to pyrotechnics shall be furnished at this time. All scale drawings of vehicles showing transmitting antenna locations with respect to the pyrotechnic devices and frequency, emission, and radiated power of the r-f transmitters or beacons shall also be furnished. All such items are subject to approval by the Wallops Range Safety Committee.

Umbilicals

Final drawings of all umbilical connections must be provided at this time.

FINAL PERFORMANCE CURVES

The performance curves submitted for long-range planning and scheduling should be finalized and resubmitted. In particular, it is important that the range user furnish the Wallops Project Engineer with a reproducible altitude-versus-range curve showing booster trajectories, ignition and burnout times (with accelerations at these times) with the time from launch marked along the curve. This will give a true time history of the flight. The user will supply 50 copies of the altitude-versus-range curves used to describe final performance since the reproduction facilities at Wallops Station are limited.

DISPERSION ANALYSIS

Give the total dispersion in terms of 1, 2, and 3 sigma curves for all impacts. The dispersion analysis data should include the following effects (show the applied values for each type):

1. Effects of thrust malalignment.
2. Effects of stage-to-stage malalignments.
3. Effects of aerodynamic malalignments.

4. Errors in wind weight corrections.
5. Effects of launcher malalignment.
6. Errors in performance predictions.

PREFLIGHT CHECK INFORMATION

Final preflight information should include the following:

1. All preflight checks to be conducted prior to the test vehicle countdown.
2. Information concerning the preflight check-out sequence that must be included in the countdown. Include an estimate of the time interval required to complete each phase.

SCHEDULE OF EVENTS

The following program events should be carefully planned and scheduled:

1. Arrival of hardware at Wallops Station.
2. Names of all range user personnel, their arrival dates, and in what locations they will be working.
3. The complete work schedule.

CHANGE ORDERS

Major changes in the test plan such as trajectory, azimuth, launch time, etc., require at least two weeks to allow liaison time with other agencies. Minor changes in the test plan such as countdown sequences, etc., should be submitted for approval not later than one week prior to the scheduled firing date.

TECHNICAL INFORMATION TIME SCHEDULE

The time schedules for the submission of technical information outlined in this section are summarized in Table 3-1.

Table 3-1. Information Time Schedules

Information Required	Submittal Time Before Test Date	See Page
Preliminary Discussions	4-6 months	6 7
General Program Description	4 months	6
Long-Range Planning and Scheduling Data	3 months	7
Final Test Preparation Data	30 days	15

SHIPPING INFORMATION

For complete shipping information, refer to Volume I, General Information. In general, all shipments, regardless of the method of shipment, are received and forwarded by the Shipping and Receiving Section, Building F-7, on the Main Base at Wallops Station. All incoming shipments should be marked showing the user's or contractor's name, project officer, and project name or number. All outgoing shipments must be packed or crated, addressed, and properly marked as to the nature and mode of transportation.

The range user or contractor will be responsible for transportation charges and all shipments from Wallops Station will be collect unless the Government is obligated under contract specifications to pay such charges.

Further information relative to outgoing and incoming shipments can be obtained by calling VAlley 4-3411, Wallops Main Base Extension 327.

DATA FORMAT

No specific format is required for data submitted to Wallops Station concerning the range user's program. The only requirements are that all data be typewritten and organized in a logical manner. In the past, certain range users have consolidated much of the required planning data on a simplified form. This is particularly useful when the user plans a continuing series of tests; however, the use of standardized forms is not necessary since the range user deals exclusively with one person, the Wallops Project Engineer.